

Patent
10/010,484

REMARKS

Claims 1-16 are pending in the application with Claims 17-21 withdrawn from consideration due to a restriction requirement. Claims 1 and 16, the only independent claims, have been amended herein.

Claims 1-16 were rejected under Section 103(a) as being unpatentable over Applicants' alleged admitted prior art (APA) in view of US Patent 6,251,730 (Luo). This rejection is respectfully traversed and reconsideration is requested.

Independent Claim 1¹, as amended herein, is directed to a trench MOSFET transistor device having a silicon substrate of a first conductivity type, a silicon epitaxial layer of the first conductivity type over the substrate, the epitaxial layer having a lower majority carrier concentration than the substrate, a trench extending into the epitaxial layer from an upper surface of the epitaxial layer, an insulating layer lining at least a portion of the trench and a conductive region within the trench adjacent the insulating layer. The device further includes a body region of a second conductivity type provided within an upper portion of the epitaxial layer and adjacent the trench, a source region of the first conductivity type provided within an upper portion of the body region and adjacent the trench, and an upper region of second conductivity type within an upper portion of the body region and laterally adjacent the source region, wherein the upper region does not extend to the trench, and wherein the upper region has a higher majority carrier concentration than the body region. Claim 1 further recites a source contact region disposed on the epitaxial layer upper surface, the source contact region comprising: (a) a doped polycrystalline silicon contact region in electrical contact with the source region and (b) a metal contact region adjacent the doped polycrystalline silicon contact region and in electrical contact with the source region and with the upper region. Claim 1 now also recites that *the source region does not contain dopant diffused from the doped polycrystalline silicon contact region.*

The Final Action takes the position that APA teaches each of the elements of Claim 1, but "does not disclose the source region comprising: a doped polycrystalline silicon contact region in

**Patent
10/010,484**

electrical contact with said source region". The Action then states that "Luo discloses the source contact region 13b comprising: a doped polycrystalline silicon contact region in electrical contact with said source region 13b and a metal contact region 33 adjacent the doped polycrystalline silicon contact region 13a and in electrical contact with the source region 13b and with the upper region" (noting lines 56-67, column 4 and lines 44-46, column 7, figs. 4, 7, 8, of Luo).

The final Office Action then states that it would have been obvious to one of ordinary skill in the art to "form the APA's device" having the recited source contact region..."in order to avoid a high resistance in the shallow source region".

In response to Applicants' previous arguments, the November 17, 2003 Advisory Action states that "lines 56-67, column 4, and lines 44-46, column 7, figures 4, 7 and 8 of Luo do show the source contact region comprising: a doped polycrystalline silicon contact region 13a in electrical contact with the source region 13b" and that "thus Applicants claims 1-16 do not distinguish over APA and Luo references".

Applicants again respectfully traverse the above assertions and submit the following comments for further consideration.

Applicants respectfully submit that both APA and Luo fail to teach or suggest a trench MOSFET transistor device as recited in each of amended independent Claims 1 and 16.

Applicants recognized that in a typical MOSFET device, the "p+ regions in the upper portions of the p-bodies... compete with the n+ source regions for contact area with the source contact" (Para. [0009]). Luo however, had no such realization or acknowledgement, but rather was directed to and focused on the use of a source region formed using a sidewall extension to produce a "localised high doped portion of a body region in a *self-aligned manner*" (col. 2, lines 12-13 and 27-30). The sidewall extension of Luo comprises "the doped semiconductor material of the source region" (col. 2, lines 18-19).

In Applicants' device on the other hand, the N+ source regions are formed *prior to* the formation of the polycrystalline silicon regions 215 (see Para's [0051] and [0053]) – so while the source region is "in electrical contact with" the doped polycrystalline silicon contact region, the

¹ Independent Claim 16 has been similarly amended herein.

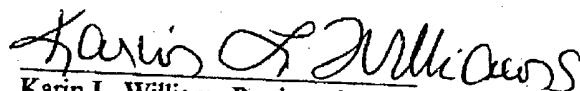
Patent
10/010,484

source region does not contain dopant diffused from the doped polycrystalline silicon contact region (as in the Luo device in which the body is heated to a dopant diffusion temperature for diffusing some of the dopant from the sidewall extension into the body to form the doped source portion (col. 7, lines 8-11).

For all of the foregoing reasons, Applicant respectfully submits that Claims 1-16 are not rendered obvious or unpatentable over any permissible combination of the teachings of APA and Luo and that the rejection should be withdrawn.

Since the Applicants have fully responded to each rejection set out in the Office Action, it is respectfully submitted that in regard to the above remarks that the pending application is patentable over the art of record. Should the Examiner be of the view that an interview would expedite consideration of this Second Response After Final Rejection or of the application at large, request is made that the Examiner telephone the Applicants' undersigned attorney at (908) 518-7700 in order that any outstanding issues be resolved.

Respectfully submitted,


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